INTEGRATED CIRCUIT
TOSHIBA
TECHNICAL DATA

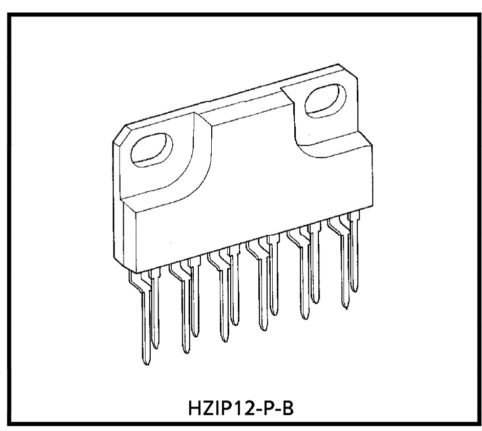
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT

TA8216H

SILICON MONOLITHIC

DUAL AUDIO POWER AMPLIFIER

The TA8216H is dual audio power amplifier for consumer applications.
This IC provides an output power of 13 watts per channel (at $V_{CC}=28V$, f = 1kHz, THD = 10%, $R_L=8\Omega$).
It is suitable for power amplifier of music center.

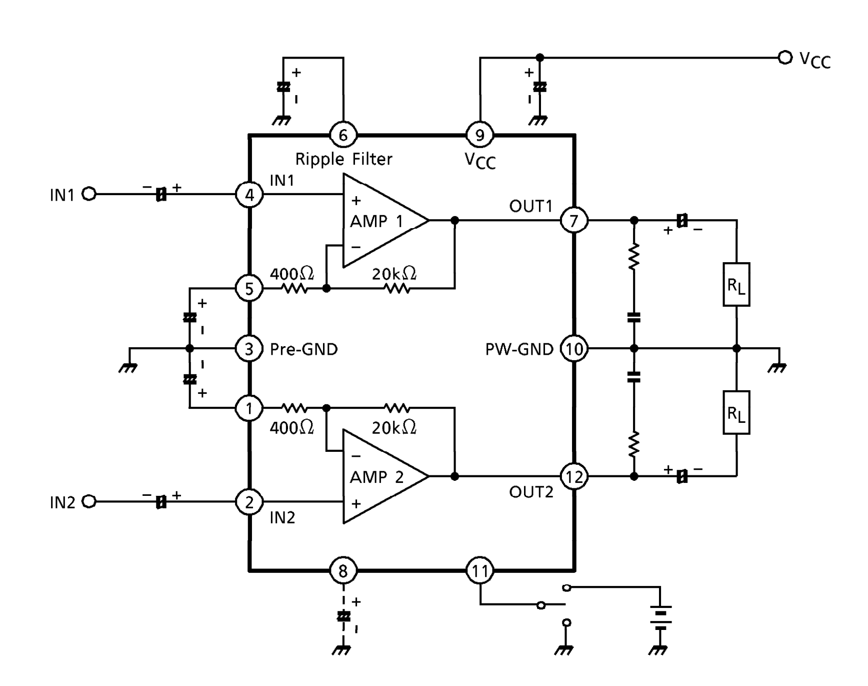

HZIP12-P-B

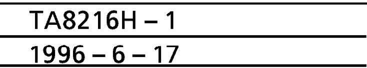
Weight : 4.04g (Typ.)

FEATURES

- High Output Power : P_{out} = 13W / channel (Typ.)
  ($V_{CC}=28V$, $R_L=8\Omega$, f = 1kHz, THD = 10%)
- Low Noise : $V_{no}=0.14mV_{rms}$ (Typ.)
  ($V_{CC}=28V$, $R_L=8\Omega$, $G_v=34dB$, $R_g=10k\Omega$, BW = 20Hz~20kHz)
- Very Few External Parts.
- Built in Audio Muting Circuit.
- Built In Thermal Shut Down Protector Circuit.
- Operation Supply Voltage Range
  : $V_{CC\,(opr)}$ = 10~37V (at $R_L=8\Omega$, Ta = 25°C)
  : $V_{CC\,(opr)}$ = 10~24V (at $R_L=4\Omega$, Ta = 25°C)

BLOCK DIAGRAM





APPLICATION INFORMATION

(1) Voltage gain

The closed loop voltage gain is determined by R_1, R_2.

$$G_V = 20\ell og \frac{R_1 + R_2}{R_2} \ (dB)$$

$$= 20\ell og \frac{20k\Omega + 400\Omega}{400}$$

$$= 34 \ (dB)$$

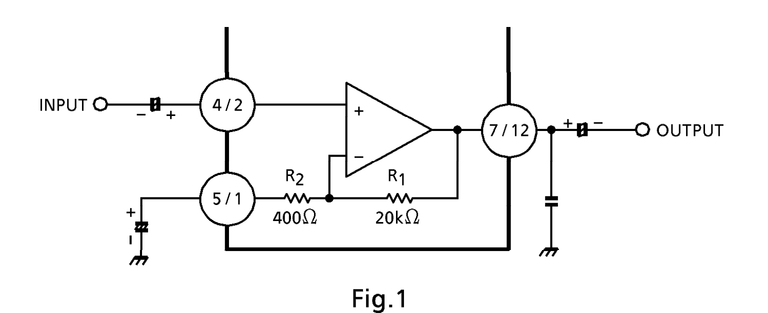


Fig.1

(2) Amplifier with gain < 34dB

$$G_V = 20\ell og \frac{R_1 + R_2 + R_3}{R_2 + R_3} \ (dB)$$

When $R_3 = 220\Omega$
$G_V \fallingdotseq 30$ (dB)
is given.

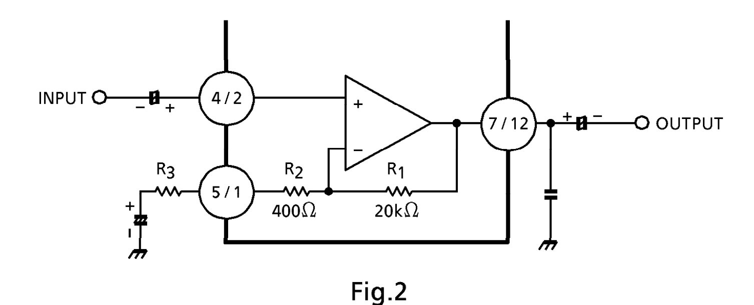


Fig.2

2. Muting

(1) Audio muting

This IC is possible to make audio muting operation by using ⑪pin muting terminal.
In Fig.3, the equivalent circuit in the muting circuit section is shown.
By means of reducing the voltage of ⑪pin down to 2.8V or less in Fig.3, Q_1 is turned ON and the base voltage of Q_2 in the differential circuit fabricated with Q_2 and Q_3.
Therefore, with the voltage reduction of ⑪pin, the input circuits of dummy of input terminal and that in the doted line operate and cut-off the input signal.
After muting, the bias circuit continues 1st operation and the power supply current of quiescent time.
⑧pin, the capacitor terminal for reducing the pop noise can reduce the pop noise through making the time constant longer by means of inserting the capacitor externary.
In the care this terminal is not used, short ⑧pin with ⑪pin.
The voltage of ⑪pin set up to 4V or more.

(2) IC internal muting at V_{CC} OFF

When V_{CC} = 8V or less at V_{CC} off, the detection circuit at V_{CC} off is operated. And the base voltage of Q_1 is reduced and the muting operation is mode.

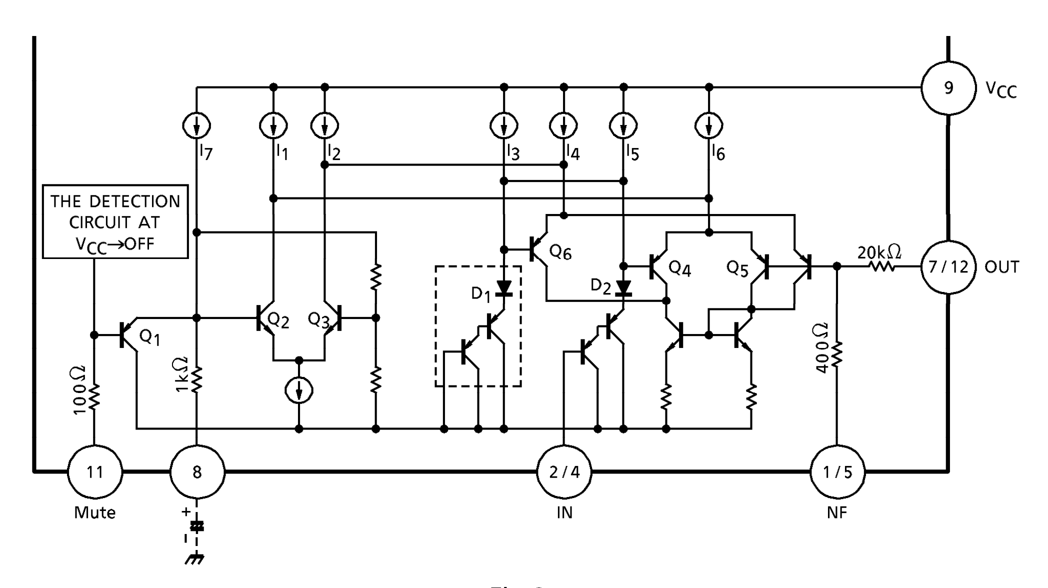
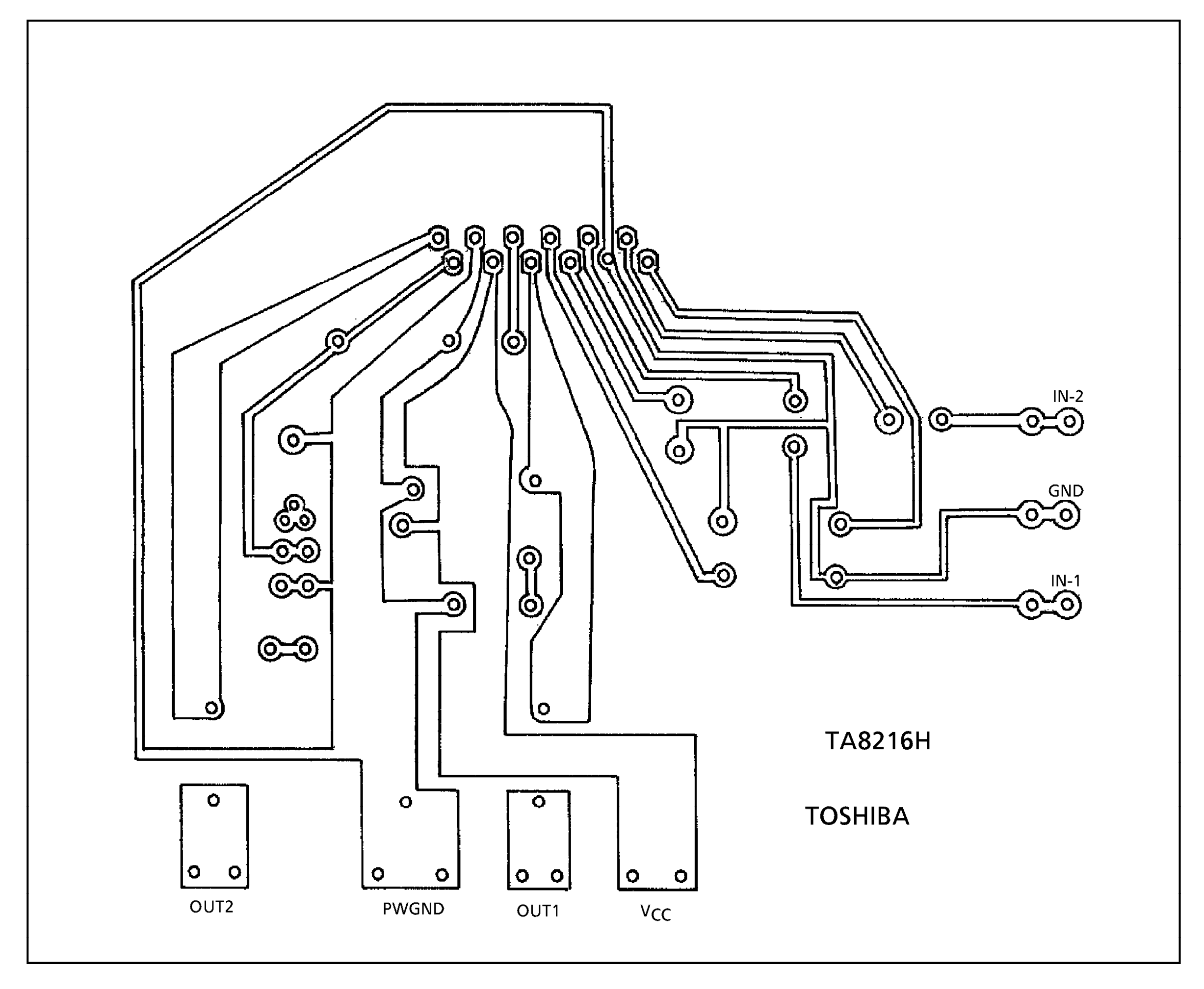


Fig.3

(3) Standard PCB TA8216H



(BOTTOM VIEW)

4. Precaution for 4Ω load resistance use

Internal output current detection and protection circuit protect the IC from the influence of unusual excess current. And this function causes the interrupted sound in case of excess input voltage with V_{CC} higher than recommended supply voltage (24V).
Therefore, the power supply regulation must be fully investigated so as not to make the V_{CC} be high than recommendation supply voltage (24V).

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	40	V
Output Current (Peak / Ch)	$I_{O\,(peak)}$	3.0	A
Power Dissipation	P_D (Note)	25	W
Operating Temperature	T_{opr}	−20~75	°C
Storage Temperature	T_{stg}	−55~150	°C

(Note) Derated above Ta = 25°C in the proportion of 200mW / °C.

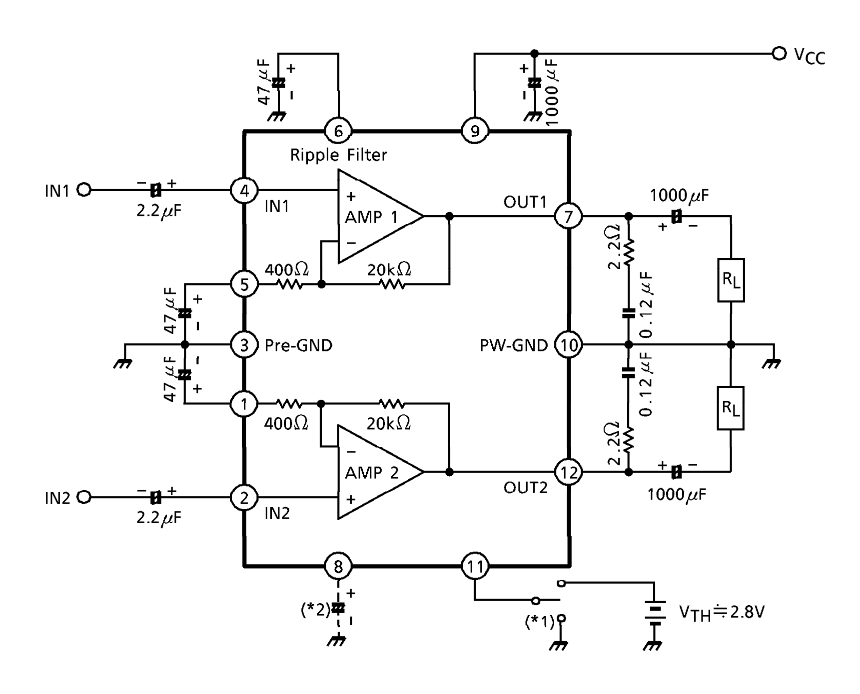
ELECTRICAL CHARACTERISTICS
(Unless otherwise specified, V_{CC} = 28V, R_L = 8Ω, R_g = 600Ω, f = 1kHz, Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Current	I_{CCQ}	—	V_{in} = 0	—	50	105	mA
Output Power	$P_{out\,(1)}$	—	THD = 10%	10	13	—	W
	$P_{out\,(2)}$	—	THD = 1%	—	10	—	
	$P_{out\,(3)}$	—	THD = 10%, V_{CC} = 24V, R_L = 4Ω	—	13	—	
Total Harmonic Distortion	THD	—	P_{out} = 2W	—	0.04	0.2	%
Voltage Gain	G_V	—	V_{out} = 0.775V_{rms} (0dBm)	32.5	34.0	35.5	dB
Input Resistance	R_{IN}	—	—	—	30	—	kΩ
Ripple Rejection Ratio	R.R.	—	R_g = 0, f_{ripple} = 100Hz V_{ripple} = 0.775V_{rms} (0dBm)	−40	−50	—	dB
Output Noise Voltage	V_{no}	—	R_g = 10kΩ, BW = 20Hz~20kHz	—	0.14	0.3	mV_{rms}
Cross Talk	C.T.	—	R_g = 10kΩ, V_{out} = 0.775V_{rms} (0dBm)	—	−70	—	dB
Muting Threshold Voltage	V_{th}⑪	—	—	2.6	2.8	—	V

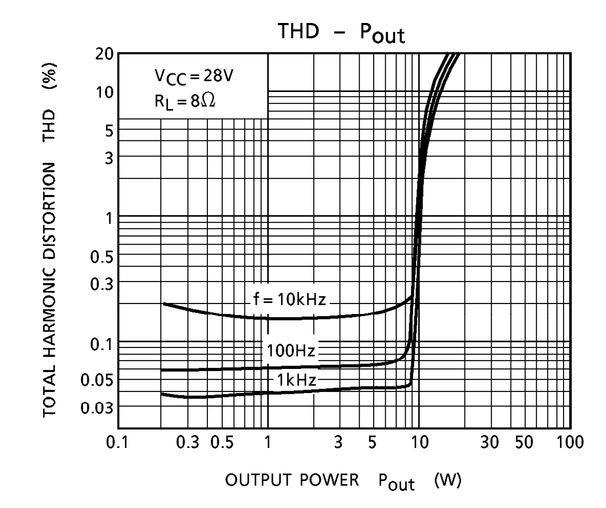
TYP. DC VOLTAGE OF EACH TERMINAL (V_{CC} = 28V, Ta = 25°C)

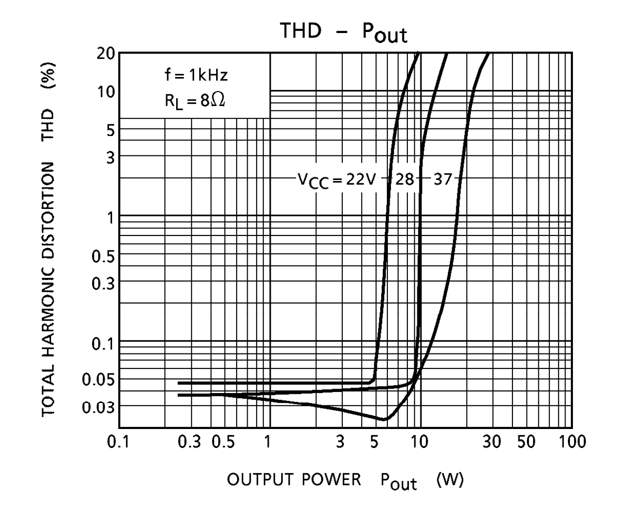
TERMINAL No.	1	2	3	4	5	6	7	8	9	10	11	12
DC Voltage (V)	1.6	20m	GND	20m	1.6	9.4	13.0	5.0	V_{CC}	GND	2.8	13.0

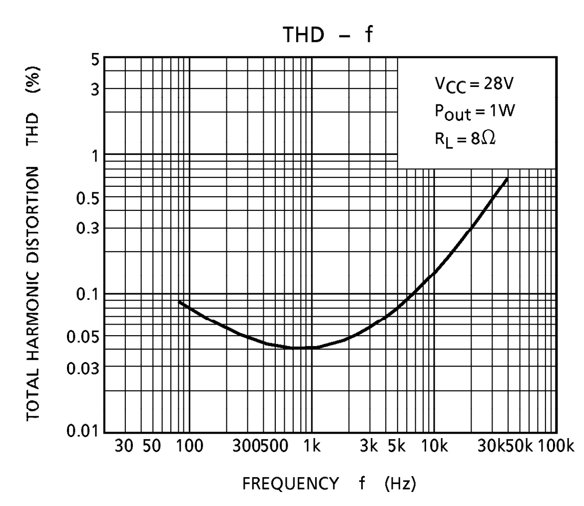
TEST CIRCUIT

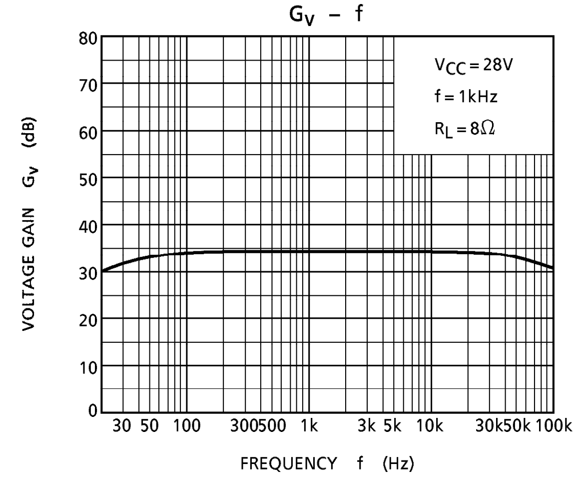


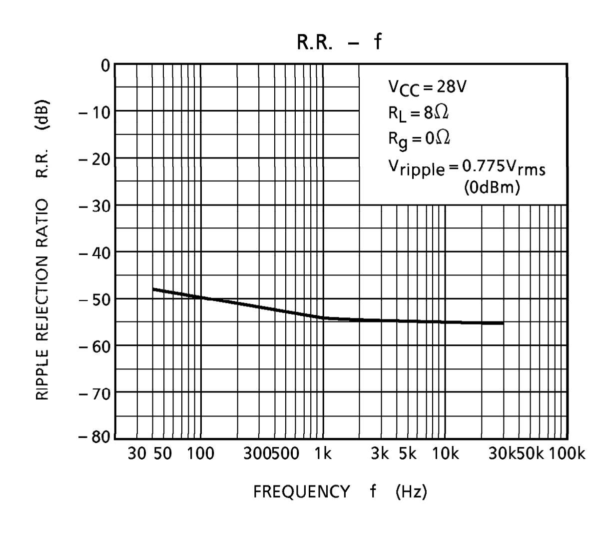
(*1) MUTE ON at ⑪pin LOW
V_{TH} = 2.8V (Typ.), V_{CC} = 28V, Ta = 25°C
(*2) The capacitor for reducing POP noise at mute ON.

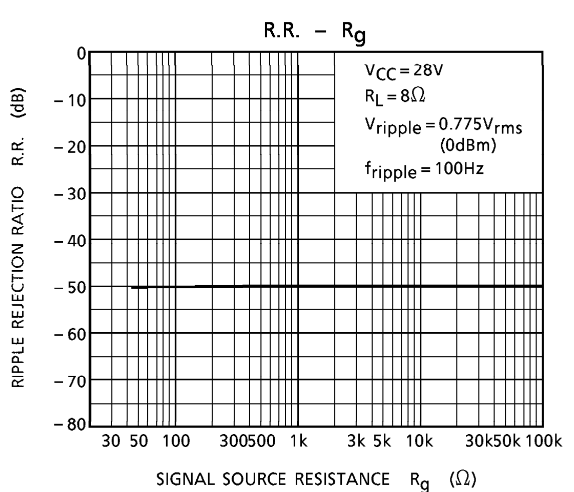

THD – Pout
VCC = 28V
RL = 8Ω
f = 10kHz
100Hz
1kHz
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT POWER Pout (W)

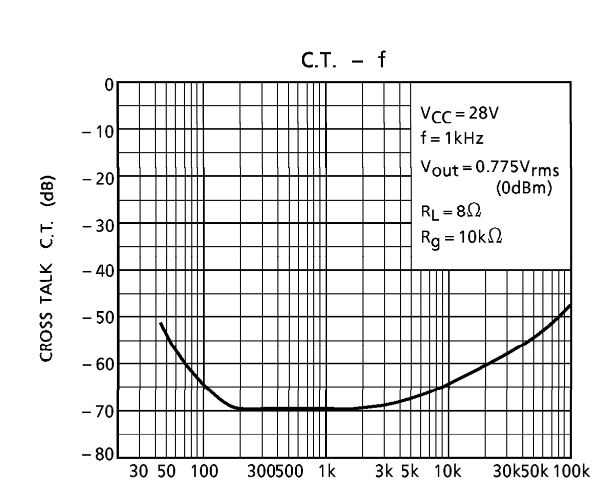

THD – Pout
f = 1kHz
RL = 8Ω
VCC = 22V 28 37
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT POWER Pout (W)

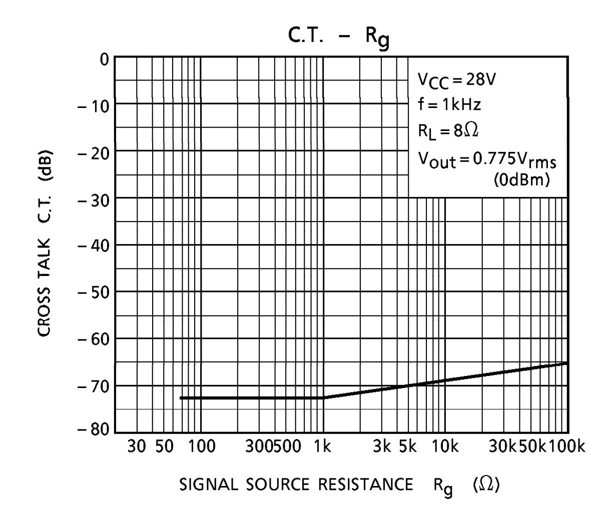

THD – f
VCC = 28V
Pout = 1W
RL = 8Ω
TOTAL HARMONIC DISTORTION THD (%)
FREQUENCY f (Hz)

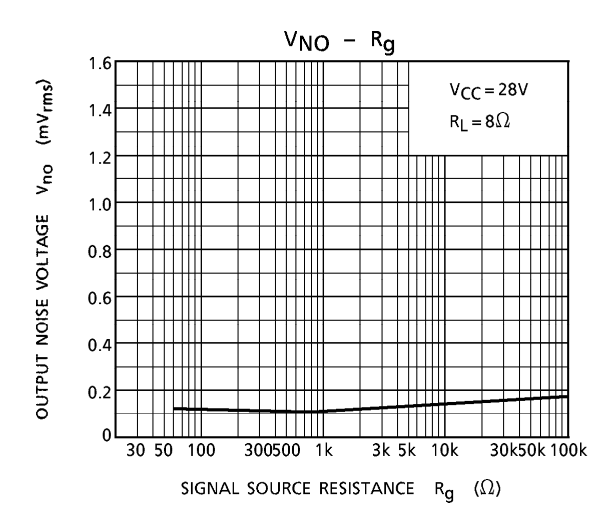

GV – f
VCC = 28V
f = 1kHz
RL = 8Ω
VOLTAGE GAIN GV (dB)
FREQUENCY f (Hz)

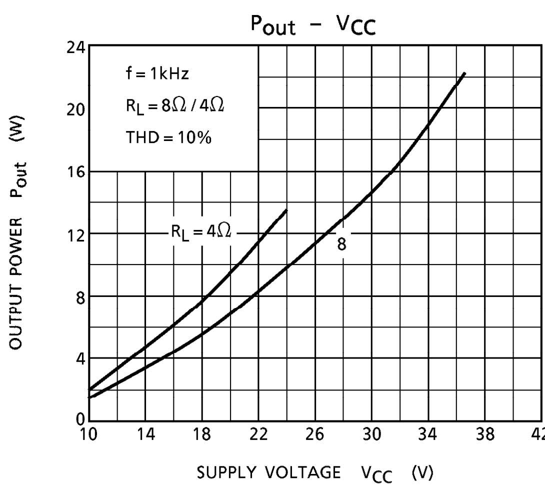

R.R. – f
VCC = 28V
RL = 8Ω
Rg = 0Ω
Vripple = 0.775Vrms
(0dBm)
RIPPLE REJECTION RATIO R.R. (dB)
FREQUENCY f (Hz)

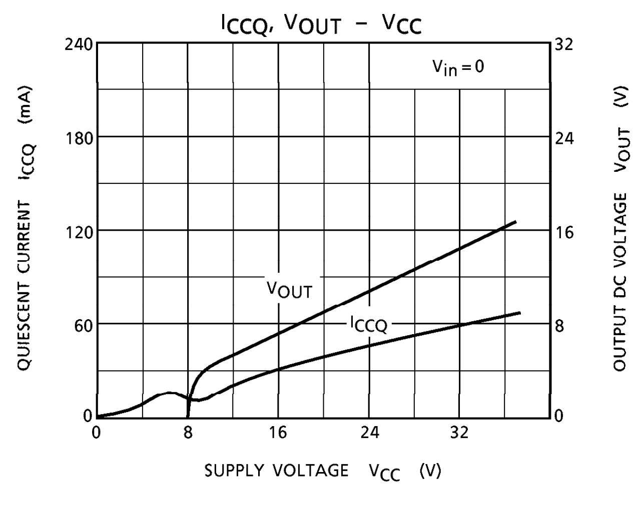

R.R. – Rg
VCC = 28V
RL = 8Ω
Vripple = 0.775Vrms
(0dBm)
fripple = 100Hz
RIPPLE REJECTION RATIO R.R. (dB)
SIGNAL SOURCE RESISTANCE Rg (Ω)

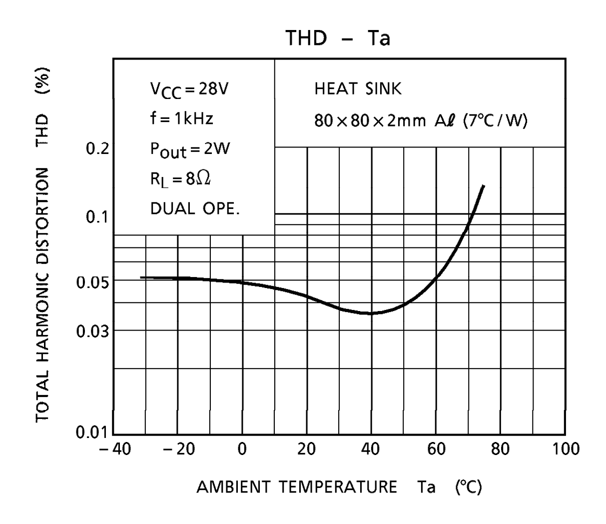

C.T. – f
V_{CC} = 28V
f = 1kHz
V_{out} = 0.775V_{rms} (0dBm)
R_L = 8Ω
R_g = 10kΩ
CROSS TALK C.T. (dB)
FREQUENCY f (Hz)
0
– 10
– 20
– 30
– 40
– 50
– 60
– 70
– 80
30 50 100 300 500 1k 3k 5k 10k 30k 50k 100k

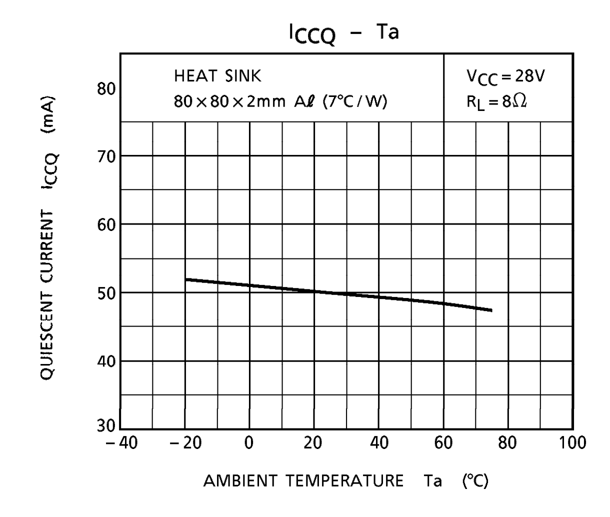

C.T. – R_g
V_{CC} = 28V
f = 1kHz
R_L = 8Ω
V_{out} = 0.775V_{rms} (0dBm)
CROSS TALK C.T. (dB)
SIGNAL SOURCE RESISTANCE R_g (Ω)
0
– 10
– 20
– 30
– 40
– 50
– 60
– 70
– 80
30 50 100 300 500 1k 3k 5k 10k 30k 50k 100k

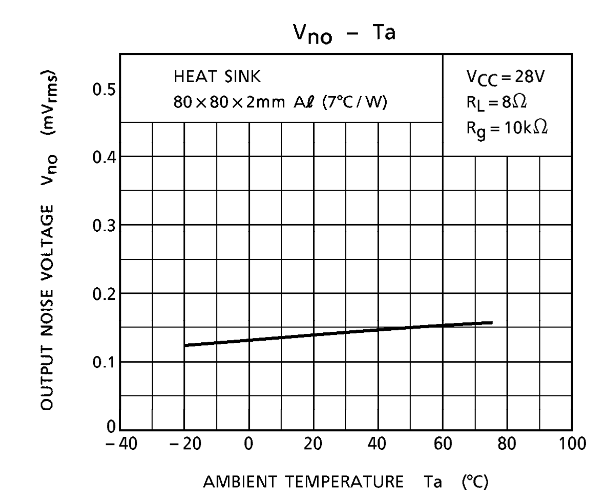

V_{NO} – R_g
V_{CC} = 28V
R_L = 8Ω
OUTPUT NOISE VOLTAGE V_{no} (mV_{rms})
SIGNAL SOURCE RESISTANCE R_g (Ω)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0
30 50 100 300 500 1k 3k 5k 10k 30k 50k 100k

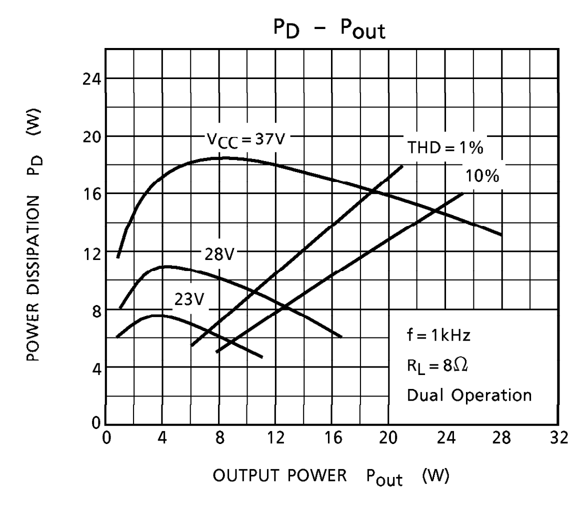

P_{out} – V_{CC}
f = 1kHz
R_L = 8Ω / 4Ω
THD = 10%
R_L = 4Ω
8
OUTPUT POWER P_{out} (W)
SUPPLY VOLTAGE V_{CC} (V)
24
20
16
12
8
4
0
10 14 18 22 26 30 34 38 42

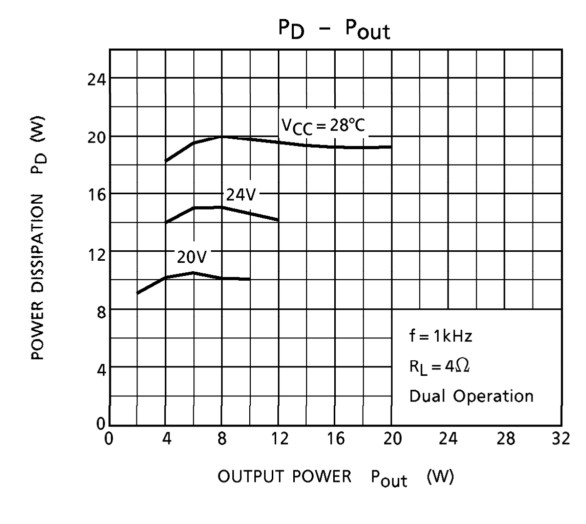

I_{CCQ}, V_{OUT} – V_{CC}
V_{in} = 0
V_{OUT}
I_{CCQ}
QUIESCENT CURRENT I_{CCQ} (mA)
OUTPUT DC VOLTAGE V_{OUT} (V)
SUPPLY VOLTAGE V_{CC} (V)
240
180
120
60
0
32
24
16
8
0
0 8 16 24 32

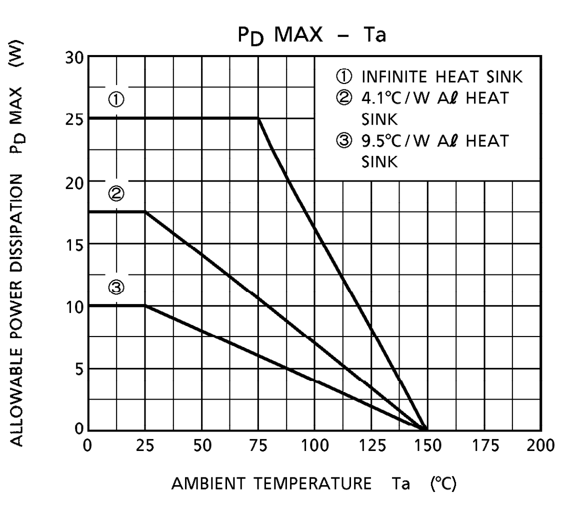

THD – Ta
V_{CC} = 28V
f = 1kHz
P_{out} = 2W
R_L = 8Ω
DUAL OPE.
HEAT SINK
80 × 80 × 2mm Aℓ (7°C / W)
TOTAL HARMONIC DISTORTION THD (%)
AMBIENT TEMPERATURE Ta (°C)
0.2
0.1
0.05
0.03
0.01
– 40 – 20 0 20 40 60 80 100

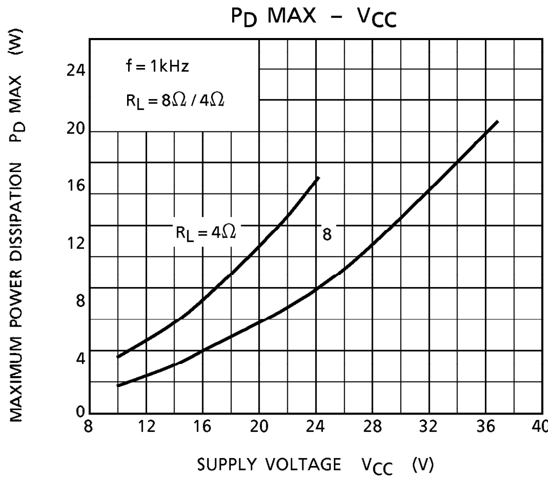

ICCQ – Ta
HEAT SINK
80×80×2mm Aℓ (7°C/W)
VCC = 28V
RL = 8Ω
QUIESCENT CURRENT ICCQ (mA)
80
70
60
50
40
30
–40
–20
0
20
40
60
80
100
AMBIENT TEMPERATURE Ta (°C)


Vno – Ta
HEAT SINK
80×80×2mm Aℓ (7°C/W)
VCC = 28V
RL = 8Ω
Rg = 10kΩ
OUTPUT NOISE VOLTAGE Vno (mVrms)
0.5
0.4
0.3
0.2
0.1
0
–40
–20
0
20
40
60
80
100
AMBIENT TEMPERATURE Ta (°C)


PD – Pout
VCC = 37V
THD = 1%
10%
28V
23V
f = 1kHz
RL = 8Ω
Dual Operation
POWER DISSIPATION PD (W)
24
20
16
12
8
4
0
0
4
8
12
16
20
24
28
32
OUTPUT POWER Pout (W)


PD – Pout
VCC = 28°C
24V
20V
f = 1kHz
RL = 4Ω
Dual Operation
POWER DISSIPATION PD (W)
24
20
16
12
8
4
0
0
4
8
12
16
20
24
28
32
OUTPUT POWER Pout (W)


PD MAX – Ta
① INFINITE HEAT SINK
② 4.1°C/W Aℓ HEAT SINK
③ 9.5°C/W Aℓ HEAT SINK
①
②
③
ALLOWABLE POWER DISSIPATION PD MAX (W)
30
25
20
15
10
5
0
0
25
50
75
100
125
150
175
200
AMBIENT TEMPERATURE Ta (°C)

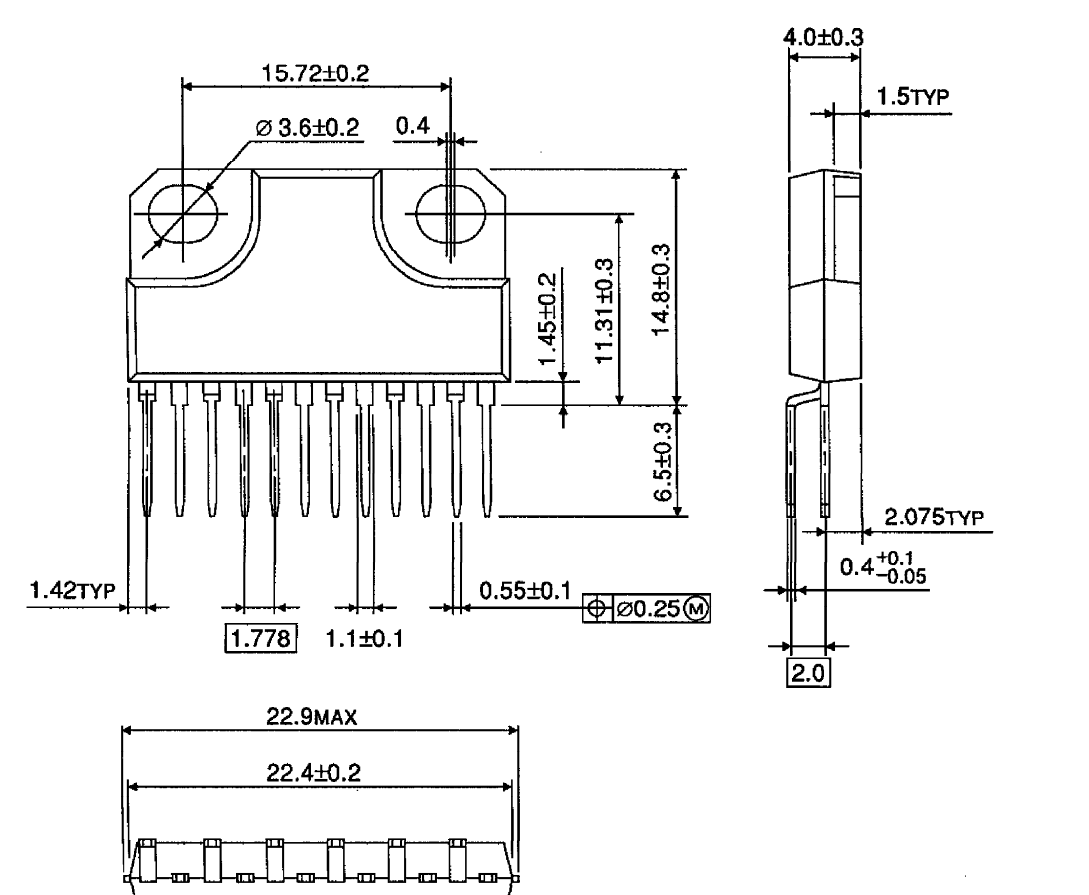

PD MAX – VCC
f = 1kHz
RL = 8Ω / 4Ω
RL = 4Ω
8
MAXIMUM POWER DISSIPATION PD MAX (W)
24
20
16
12
8
4
0
8
12
16
20
24
28
32
36
40
SUPPLY VOLTAGE VCC (V)



OUTLINE DRAWING

HZIP12-P-B

Unit : mm



Weight : 4.04g (Typ.)